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that is to say, a region, rising roughly from 2,000 to 3,000 feet above the snow-line, generates a glacier which descends more than 2,000 feet below it.

But what change is required to give a glacial epoch to Switzerland? It is generally agreed that an ice-sheet has enveloped the whole of the lowland region between the Alps and the Jura. Let us assume, that, other conditions remaining the same, this could occur if the mean annual temperature of this lowland were reduced to 32° . Its present mean temperature varies somewhat; for instance, it is 45.86° at St. Gall, 49.64° at Lausanne. Let us take 47.5° as an average, which is very nearly the mean temperature of Lucerne.¹ So this lowland requires a fall of 15.5° . We may take the average height of the region as 1,500 feet above the sea. If, then, we begin the effective gathering-ground at 1,000 feet higher, the valley of the Reuss from well below Wasen, and the valley of the Rhone from a little above Brieg, would be buried beneath *névé*: so that probably a fall of 16° would suffice to cover the lowland with an ice-sheet, and possibly bring its margin once more up to the Pierre-à-bot above Neuchâtel; at any rate, a fall of 18° would fully suffice, for then the mean temperature of Geneva would be slightly below 32° .

The line of 41° passes through Scandinavia a little north of Bergen. If, then, the climate of Norway were lowered by the same amount, which also is that suggested for Britain, the temperature at this part of the coast would be 23° , corresponding with the present temperature of Greenland rather south of Godhavn, and probably no part of Norway would then have a higher mean temperature than 26° .

The wants of North America are less rather than greater; though, as geologists affirm, an ice-sheet formerly buried all the region of the Great Lakes, and descended at one place some fifty leagues south of the 40th parallel of latitude. Its boundary was irregular; but, if we strike a rough average, it may be taken as approximately corresponding with the present isotherm of 50° . The temperatures, however, in North America fall rather rapidly as we proceed northwards. Montreal is very nearly on the isotherm of 45° , and this passes through the upper part of Lakes Huron and Michigan; that of 39° runs nearly through Quebec and across the middle of Superior; while at Port Arthur, on the same lake, the temperature is only 36.2° . If, then, we assume sufficient precipitation, the maximum fall of temperature required for this North American ice-sheet will be 18° ; but less would probably suffice, for the district north of the St. Lawrence would be a favorable gathering-ground. This would be brought within the isotherm of 32° by a fall of 12° , or, at most, of 13° .

It seems, then, that if we assume the distribution of temperature in the northern hemisphere to have been nearly the same as at present, we require it to have been lowered, at any rate in the regions named, by about 18° , in order to bring back a glacial epoch. For North Wales a reduction of about 20° might be needed; but, if the isotherms ran more nearly east and west, 18° for the Thames valley might suffice. If we assume the great extension of glaciers in central and north-western Europe to be contemporaneous with that in America, we must suppose that these parts of the northern hemisphere had a climate more nearly resembling, but even colder than, that which now prevails in the southern hemisphere. The isotherm of 40° runs a little to the south of Cape Horn; that of 45° passes north of the Straits of Magellan. The latter lie on parallels of latitude corresponding with those of North Wales, but their mean temperature is about 8° lower. If we could restrict ourselves to the British Isles, it would be enough to assume a different distribution of temperature from that which now prevails on the globe, for at the present time, and in the northern hemisphere, the isotherm of 32° twice comes down very nearly to the latitude of London; but it may be doubted whether this alone would account for the great extension of the Alpine glaciers, and the difficulties seem yet greater in the case of North America. Here, where even at present the temperature is rather abnormally low, we have to make a very considerable reduction. But this is too wide a question to discuss at the end of an article

¹ St. Gall, 45.86° F.; Berne, 46.58° ; Lucerne, 47.48° ; Zurich, 48.20° ; Neuchâtel, 48.74° ; Geneva, 49.46° ; Lausanne, 49.64° . St. Gall and Berne are rather high stations, the one being 2,165 feet, the other 1,760 feet. The lake of Lucerne is 1,487 feet above the sea.

in these pages. We seem, however, fairly warranted in concluding that, whatever may have been the cause, a lowering of temperature amounting to 18° , if only the other conditions either remained constant or became more favorable to the accumulation of snow and ice, would suffice to give us back the glacial epoch.

T. G. BONNEY.

A NEW DEPARTURE IN DEAF-MUTE EDUCATION.¹

THE attention of instructors of the deaf and their friends has in various ways within the past few months been called to a proposal, very briefly outlined in the annual report of the Columbia Institution, for the enlargement of the facilities for normal training already existing in this college.

Misapprehensions have naturally arisen as to what was proposed, because, in the absence of any official utterance, unauthorized persons have taken it on themselves to publish conclusions based purely on presumptions, or, in some instances, on incomplete statements and perverted inferences.

As the plans of our directors for the "new departure" are now measurably complete, final action having been only reached in a meeting of the board held this day, I take pleasure in announcing that the teaching force of our institution will be increased next year by the employment of an experienced instructor in articulation, who will be especially devoted to the promotion of speech and lip-reading in the college.

Liberal provision has recently been made for this object by Congress.

The directors have to-day established six normal fellowships, of the value of five hundred dollars each per annum, to which graduates of colleges will be appointed for one year. These fellows will be required to reside in the institution, and will receive instruction in both the manual and the oral methods of teaching the deaf. They will, in view of the advantages to inure to them from these fellowships, be expected to perform certain duties in the institution, and will therefore constitute a distinct addition to its teaching force.

The funds for sustaining these fellowships are at the disposal of the board from sources other than the treasury of the United States.

The suggestion of establishing these fellowships, with a view of training instructors of the deaf of the highest grade, is taken from the arrangement existing in the Johns Hopkins University at Baltimore, from the ranks of whose fellows college professors, principals of high schools, and other instructors of high rank, are drawn in large and increasing numbers.

JOHNS HOPKINS UNIVERSITY,

BALTIMORE, MD., March 5, 1891.

Dr. E. M. GALLAUDET,

President National Deaf-Mute College.

Dear Sir,—I am very much interested in what you have told me of your plans and hopes for the development of the National Deaf-Mute College. Particularly it seems to me wise that you should give prominence to the fact that articulation is taught, by designating a competent instructor who should have a specific title indicating that he performs this service. I am even more interested in what you say of the possibility of enlisting annually half a dozen or more men in the service of the college, who would not only be valuable assistants during their residence with you, but would be trained for permanent careers in the various institutions of the land. Such a system here has been most fruitful in good results, and I can easily foresee how a carefully chosen staff of associates or fellows in the National Deaf-Mute College, holding an intermediate position between the permanent members of the faculty on the one hand, and the students on the other, would inspire the teachers, help the scholars, and furnish, in time, a corps of instructors for the schools for the deaf, which now exist in such considerable numbers throughout the country.

Yours sincerely,

D. C. GILMAN.

The above letter from President Gilman had much weight with our directors in their deliberations to-day.

¹ Circular of Information issued by the National Deaf-Mute College, Washington, D.C., March 7, 1891.

The advantages to the profession of deaf-mute instruction in this country, growing out of the normal fellowships now established, are many and obvious.

First of all, opportunities will be furnished to schools for the deaf to secure the services of young men and women possessed of all their faculties, of the highest education and character, with a knowledge of the natural language of the deaf, and capable of teaching by either the manual or the oral method, as circumstances may require.

These young teachers will have had not only good academic and collegiate training, but also, besides all they will gain at Kendall Green, at least a year's residence in Washington, where valuable opportunities are found for culture in the public libraries, museums, legislative halls, courts, and many other places where contact with men of high attainments is possible.

In our "new departure" the training of "deaf teachers of the deaf" will have its proper share of attention, but not that position of exaggerated importance to which it has been assigned by certain persons who have been self-appointed to speak for the college.

Those of our own students whom it may seem wise to encourage to become teachers will have all needed help in their laudable endeavor; and it is believed that the future will show, as the past has done, many of our graduates doing as good and as useful work in the instruction of their fellow deaf-mutes as can be accomplished by the best hearing and speaking instructors.

In closing this circular, the writer desires to say that the plans for increasing the usefulness of the college herein unfolded are precisely those that have been in his mind for many months, having suffered no modification by recent events.

It did not seem best to give them to the public until the ability to carry them into effect existed.

They are now communicated in the hope that they will be accorded the sympathy, the approval, and the co-operation of instructors of the deaf of all methods, of the deaf themselves, and of those friends of the cause of deaf-mute education who believe in trying to attain the greatest possible good for the greatest possible number.

EDWARD M. GALLAUDET,
President.

NOTES AND NEWS.

A PRESS despatch from Panama states that the United States Fish Commission steamer "Albatross" arrived at that port on Feb. 17, eighteen days from San Francisco *via* Acapulco. She went there to meet Professor Agassiz, who arrived from New York on the "Newport," and under his direction will make a scientific cruise in tropical waters. The area under investigation comprises the Gulf of Panama, the Galapagos, and thence to Acapulco.

— An interesting paper on the destruction of wolves in France appears in the current number of the *Revue Scientifique*, says *Nature* of Feb. 12. The law in virtue of which rewards are given for the killing of wolves was passed on Aug. 3, 1882, and during the last four months of that year 423 were destroyed. In 1883 the number killed was 1,316, the sum paid in rewards being 104,450 francs. The number was 1,035 in 1884, 900 in 1885, 760 in 1886, 701 in 1887, 505 in 1888, 515 in 1889. The departments in which most animals have been slain are Dordogne and Charente. It is believed that very soon no specimens will be left in France except those which occasionally reach it from neighboring countries.

— During the present season, according to *Nature* (Feb. 19), an attempt is to be made to extend our knowledge of the wild tribes inhabiting the borderland of Burmah, between Bhamo and the Chinese frontier on the one hand, and between the Northern Shan States and the Chinese frontier on the other. Lieut. Daly, superintendent of the Northern Shan States, and Lieut. Elliott, assistant commissioner, will spend the greater part of the next six months exploring these regions. The former will have with him an escort of fifty men of the military police, and will be accompanied by Mr. Warry of the Chinese Consular Service, and Lieut. Renny

Tailyour of the Survey Department. He starts from Lashio, and will visit the states on the Salween, including the important state of Kyaingyanyi, and will then return along the supposed Chinese border, ascertaining its situation as accepted on the spot, and the nature of the country and the tribes inhabiting it. Mr. Elliott will start from Bhamo, and will be accompanied by Major Hobday of the Survey Department. These officers also will be supplied with an escort of military police. They will probably proceed up the right bank of the Irrawaddy to the bifurcation of the river, and then will cross and examine the country on the Chinese border on the left bank. The country is practically unknown at present, and it is expected that much information of an interesting nature will be collected by the exploring parties. The explorers will, of course, confine their attention to the British side of the border, and, when the time comes for the formal demarcation of the frontier by a joint commission of Chinese and British officials, the information now to be collected will, no doubt, prove useful.

— The *Journal of the Society of Arts* (London) states that the production of wine in France for the year 1890 amounted approximately to 27,416,000 hectolitres, or 603,000,000 gallons, — a proportion of 330 gallons to each hectare of land (a hectare is equivalent to 2.47 acres) under vine-cultivation. This shows an increase of 92,000,000 gallons over 1889, and a falling-off of 50,000,000, when compared with the average production of the last ten years. The increase is observable in 45 departments. *Per contra*, a falling-off was noticed in 31 departments. Viticulturists appear to have employed, as compared with 1889, much larger quantities of low-class sugars to improve the quality of their products, or to increase the yield. The quantity of wine declared for sweetening, which amounted in the first ten months to 19,561,618 kilograms, exceeded, in the period ending Oct. 31, 1890, 32,000,000 kilograms. It was necessary, as usual, to have recourse to large importations of foreign wines. During the first eleven months of last year, the quantity purchased from abroad amounted to 219,000,000 gallons. Spanish wines figured in the list to the extent of 150,000,000 gallons; Italian, 396,000; Portuguese, 4,180,000; Algerian, 38,000,000; and Tunisian, 198,404. In Algeria, wine-cultivation continues to make progress. The area under vines has increased by 3,699 hectares, in 1890; and the yield amounted to 62,568,000 gallons in that year, as compared with 55,264,000 gallons in 1889. As regards cider, the yield in France, in 1890, exceeded that of 1889 by 162,000,000 gallons, and only falls short of the average production of the last ten years by 24,000,000 gallons. In Brittany and Picardy the yield was generally greater than that of an average year; in Normandy it was not so good, and the same remark applies to Mayenne and La Sarthe.

— Among the appropriations made by the Sundry Civil Bill passed at the close of the last session of Congress are the items, aggregating \$430,000, for the purchase of the Butler and Richard buildings for the use of the United States Coast and Geodetic Survey of the Treasury Department. The survey has occupied the latter building as an office since its erection in 1872, also one tenement (of the three) of the Butler building; but the increased demand for charts has rendered it necessary to greatly enlarge its printing-plant by the addition of more presses, etc. The triangulation, astronomical, magnetic, gravity, levelling, tidal, and sounding records, and the original maps of the survey, form a very valuable collection, both for reference and for comparative study. These have been steadily accumulating until they have reached such a magnitude that it has been almost impossible to handle the current work of the office. The Weights and Measures Office is also included in this bureau, and, as science advances, the demand for increased accuracy keeps pace with it; and this office is called upon to verify for colleges, manufacturing firms, and many other business institutions, as well as for the government bureaus and the several States, weights and measures of many and diverse descriptions. The question of space has long been a serious drawback and hinderance to the ready prosecution of the work intrusted to it. The bureau has reason to be congratulated upon the acquisition of a home which belongs to the government, and not being longer dependent upon landlords for keeping in repair even the roof over its head. The property ac-